Lesson 1 — Robot Basics: Meet Your Robot

Course: 6-8 Robotics

Grade Level: 6th through 8th Grade

Time Required: 90 Minutes

Overview & Purpose

This lesson introduces students to basic components of a robot and how robots can be controlled by manual driving or automated programs. Students will explore robot parts, safety rules, and basic robot movement while completing their first Rapid Response League training mission.

Mission Context (Storyline)

Students are recruited into the Rapid Response League, a global team that deploys robots to assist in disaster response missions.

Before robots can be deployed into disaster zones, rescue teams must learn how their robots work and complete a training course.

Mission Scenario:

Welcome recruits!

You have been selected to join the Rapid Response League.

Before you can deploy your robot into disaster zones, you must complete robot training.

Your robot must pass the training course by navigating through the practice area safely and accurately.

Education Standards

Computer Science Teachers Association Standards (CSTA)

- 2-CS-02 — Design projects that combine hardware and software components.
- 2-AP-13 — Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs.
- 2-AP-15 — Seek and incorporate feedback from team members to refine a program.

International Society for Technology in Education Standards (ISTE)

- 1.1 Empowered Learner — Students use technology to set goals, work toward achievement, and demonstrate competency.
- 1.4 Innovative Designer — Students use a design process to solve problems.
- 1.5 Computational Thinker — Students develop and test algorithms and programs.
- 1.7 Global Collaborator — Students use digital tools to collaborate with others.

21st Century Skills Alignment

- Critical Thinking — troubleshooting robot driving and programs
- Collaboration — working in robot teams
- Communication — exit ticket and discussions
- Creativity — designing boot sequence
- Problem Solving — programming robot movement
- Technology Literacy — programming robots
- Initiative / Self-Direction — completing mission challenges

Next Generation Science Standards (NGSS)

- MS-ETS1-1 — Define criteria and constraints of a design problem.
- MS-ETS1-2 — Evaluate competing design solutions.
- MS-ETS1-3 — Analyze data from tests to improve a design.

Objectives

[Slide 3] Students will be able to:

- Identify basic robot components
- Safely operate a robot
- Manually drive a robot through a course
- Understand that robots follow instructions called programs
- Create a very simple movement program

Materials Needed

- Lesson Presentation
- Masking or Painters Tape
- Small obstacles (cups, books, cones, etc)
- Per Group:
  - 1x VEX IQ Build Kit
  - 1x Student device that can access https://codeiq.vex.com/
  - 1x Lesson 1 Student Activity Sheet

Vocabulary

- Robot: A machine that can be programmed to perform tasks
- Program: A set of instructions for a robot
- Manual Control: When a human directly drives a robot
- Autonomous: When a robot runs a program by itself
- Safety: Rules to prevent damage or injury
- Block Code: Drag-and-drop programming

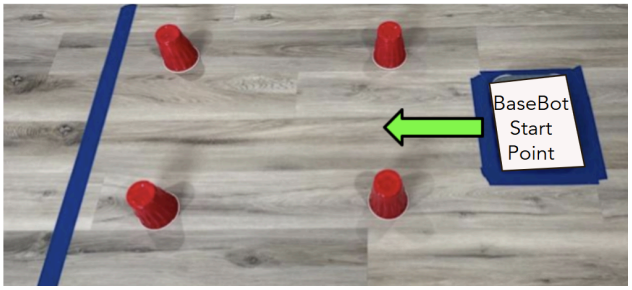
Engage (10 Minutes)

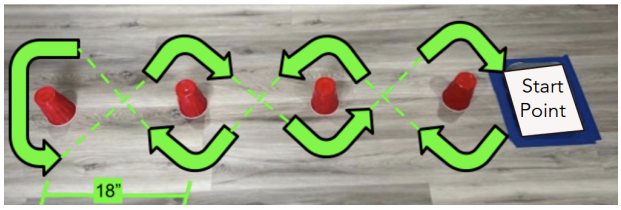
1. **[Slide 4]** Introduce the course story: “Today you are joining the Rapid Response League. Your robots will be used for search and rescue missions, but first you must learn how to operate them.”
2. **[Slide 5]** Ask/discuss with students:
    - What is a **robot**?
    - Where have you seen robots?
    - What jobs do robots do?
    - How do robots know what to do?
    - Explain that robots can be **manually controlled** by an operator, or can follow preset instructions called **programs**.
3. **[Slides 6]** Provide the PDF build instructions to student groups and have them build the BaseBot.
    - Circulate through groups and help when needed
    - The build portion should require **~30 minutes**
4. **[Slide 7]** Introduce Robot Safety Rules:
    - Keep robots on the floor
    - Keep fingers away from wheels
    - Stop robot if it is out of control
    - Carry robots carefully
    - Only run programs when area is clear

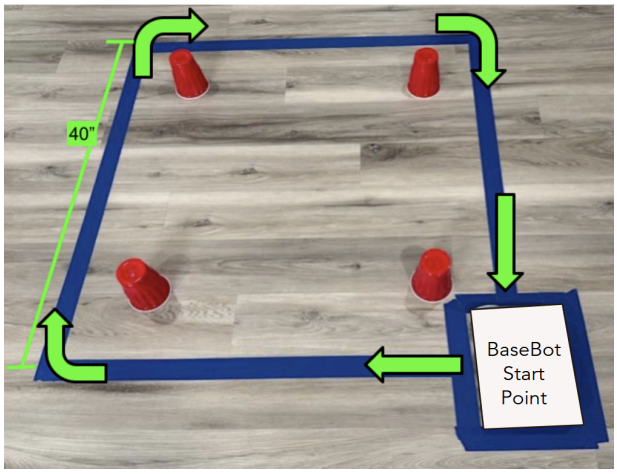
Explore (10 Minutes)

5. **[Slide 9]** Use the provided instructions to help student groups pair their controller with the VEX Brain. This step will not be necessary in future lessons.
6. **[Slide 10]** Use the provided instructions to show students how to start manually controlling their robots.
7. **[Slide 11]** Explain that students will complete three obstacle courses using manual control:
    - Drive forward and stop as close as possible to a line (1)
    - Slalom through obstacles (2)
    - Drive in a square, and end exactly at the start point (3)

- **These driving challenges are suggestions, but feel free to modify based on your classroom and available materials!**







8. Have each group connect to their BaseBot and begin practicing on the courses using manual control.

Explain (10 Minutes)

9. **[Slide 13]** Discuss with student groups:
    - Was it easy to drive perfectly?
    - Did the robot always stop where you wanted?
    - Would it be easier if the robot could drive itself?
10. **[Slide 14]** Introduce the concept of a **program**: “A program is a set of instructions that tells a robot what to do.”
11. Show a very simple block program example:

- Drive forward
- Stop
- Turn right
- Drive forward
- Stop

12. Explain that robots do exactly what we tell them to do. They do not think; they follow instructions.
13. **[Slide 15]** Show students the process of creating and uploading a program to their robots:
    - Go to codeiq.vex.com
    - Select the BaseBot (Drivetrain 2-motor) example
    - Create the program by pulling block from the left menu into the screen
    - Connect to the VEX Brain
    - Click Download, then Run

Elaborate (25 Minutes)

14. **[Slide 17]** Relate to mission story: “Before robots can begin a rescue mission, they must run a startup sequence to show they are ready for deployment. Your job is to program your robot’s boot sequence.”
15. Students must program their robot to:
    - Write “Starting Up” on the Brain’s screen
    - Drive forward
    - Rotate 360 degrees
    - Make a sound
    - End program
16. Circulate between groups and complete understanding check-ins
17. If students achieve this goal quickly, add extension challenges:
    - Add a turn
    - Add a countdown
    - Add a “robot dance”

Evaluate (5 Minutes)

18. **[Slide 19]** Exit ticket questions:
    - What is a robot?
    - What is a program?
    - What is the difference between manual driving and a program?
    - How did your program control the robot?
19. Give students time to answer the exit ticket questions.

Differentiation

To make this lesson more accessible to emerging learners:

- Provide a pre-built boot sequence example that students can modify instead of starting from scratch
- Reduce the number of required steps in the boot sequence (for example: drive forward → stop→ sound)
- Pair emerging learners with a partner who can assist with programming and robot setup

To extend this lesson:

- Challenge students to add additional steps to their boot sequence (turn, reverse, spin, etc.)
- Have students add a repeating light pattern using loops (if they discover loops in the block menu)
- Ask students to draw a flowchart of their program

